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An instance of the importance attached to the teaching of veterinary science in Canada is shown by the fact that the Ontario Veterinary College was, a few years ago, attached to the University of Toronto and a Faculty of Veterinary Science established.

The original College owes its start, and, indeed, its popularity (for the Ontario graduates number more than those of any other Canadian or American College), to the energy and capable administration of the late Professor Andrew Smith, who pioneered veterinary science in Canada from a very humble commencement to its present secure position.

Born in the parish of Dalrymple, Ayrshire, Scotland, the only son of the late James Smith, a well-known farmer in that district, he obtained his early education at the Dalrymple Public School, and then went to Edinburgh Veterinary College, where he graduated with the highest honours in 1861.

In 1861 steps were taken to establish a veterinary course in Toronto in connection with the late Professor George Buckland's agricultural class in the University of Toronto. The late Professor Dick, of Edinburgh, recommended Mr. Smith for the position, and he came to Canada and began a course of teaching in 1862, from which has developed the Ontario Veterinary College.

Mr. Smith was a member of the Senate of Toronto University and a Director of the Industrial Exhibition, and for two years he was President of the Exhibition. His services as a judge at horse shows were in demand all over the Continent, and he was also Master of the Toronto Hunt for ten years. For several years he was Chairman of the Executive Committee of the Ontario Jockey Club, and owned many valuable and successful racehorses. His name is, and always will be, a household word in Canada wherever veterinary science is discussed.

Editorial.

BIER'S TREATMENT IN VETERINARY PRACTICE.

An original paper on the above subject, which appears in this month's issue, is worth bringing to the especial notice of our readers, as the subject is one of very great importance from a clinical standpoint and is dealt with in a very lucid manner by the writer.

The methods of application are so simple that they can be carried out by anybody of average intelligence under even the most superficial veterinary supervision, with a minimum of expense in the cost of appliances and apparatus.

If an editorial hint might be put forward it is that our readers shall give the method an impartial and open-minded trial in a number of selected cases—say, at least ten—and report the results in our columns. The results of such in, say, ten busy practices would settle the question for good and all as a practical and reasonable course of treatment in veterinary patients. In particular is the hint worth following up in regard to cases of laminitis.

HORSE ABATTOIRS FOR ENGLAND.

THE value of horse flesh for human food is not appreciated in England and very many people would turn up their eyes in pious horror at the idea, although at the same time reports in the public press show almost every day the existence of cruelties, in the shape of working unfit animals, which in Holland would certainly not be allowed.

The horse flesh trade of Holland and Belgium is largely dependent for its supply upon Great Britain, and for this reason it is necessary that our Government shall exercise veterinary supervision over the animals sent to meet the demand.

During the past few years veterinary inspectors have been appointed at each port of embarkation, and even so recently as a few months ago their hands were strengthened in regard to the powers allotted to them to reject or pass the animals brought before them for exportation. There is yet, however, amongst a certain section of the general public a strong feeling that more might be done; and although there is no absolute desire to abolish what is quite a legitimate trade, there is a strong sentimental feeling that the people of England, whose work on the humane treatment of animals is so well known all over the world, should see that the final scene was played on *this* side and not left to the tender mercies of those who speak another language, and are not always imbued with the same fine feelings.

For this purpose a scheme is now on foot, with strong financial promise of support, to erect abattoirs in England where horses may be killed humanely and the flesh properly dressed, and afterwards inspected by qualified meat inspectors before being sent abroad. If, as seems likely, the scheme is carried out, the trade abroad in decrepit horses will inevitably cease, although it will have to rest with us more than ever to see that in conveyance to the places of slaughter no cruelty is inflicted. It is only by veterinary inspection and veterinary certificates that such can be prevented, and by making those in charge of the transport arrangements legally responsible, the end desired must inevitably be attained.

General Articles.

BIER'S HYPERÆMIA TREATMENT IN VETERINARY PRACTICE.

By CHARLES HARTLEY, Jun., F.R.C.V.S.
Lincoln.

My attention was first drawn to Bier's passive, or venous congestion, treatment, by seeing its marvellously successful application in a case of septic infection of a wounded finger incurred while making an autopsy.

This led me to attempt its use in veterinary practice, and whilst it has a more limited field there than in human surgery, I am convinced that it enables us to treat many pathological conditions more successfully, easily, and humanely, than can be done by any other method.

Professor Von Bier employs two kinds of hyperæmia, which he distinguishes as active and passive.

The active hyperæmia essentially consists of the dilatation of the arterial vessels, which induces an increased supply of red blood to the part, and for this purpose he employs a direct current of heated air. I do not intend to discuss this method here, though it is interesting to note that some years ago experiments on horses and dogs, as well as with human patients, with the Dowsing system of radiant heat were made with a considerable measure of success. With this method temperatures up to 280° F. were endured without discomfort, and the hyperæmia was found useful in cases of muscular rheumatism, tendon sprains, and disturbances of the circulation.

Passive hyperæmia is the induction of a venous congestion by partially stopping the outflow of blood from the tissues.

The treatment of disease by hyperæmia is one of the oldest methods known, cupping glasses, irritants, rubefacients, blisters, and the actual cautery having been used for this purpose from time immemorial.

It is Nature's own cure for injury or disease by producing inflammation in the part concerned. If the reinforced blood-stream is able to successfully deal with the trouble the inflammation subsides; or, if unsuccessful, the tissue elements are

destroyed and necrosis results. Bier states that the inflammatory processes appearing in a diseased part, of which the increased supply of blood is the chief, are not harmful, but are the body's own attempt to remove the trouble. He reasons that the old-established antiphlogistic treatment is wrong, and that one should encourage a moderate degree of inflammation, and that there can be no healing of a tissue unless it is in a hyperæmic condition.

I believe that Bier was the first to make use of a pure induced hyperæmia, and his methods have been largely followed both here and on the Continent with great success. In human practice passive hyperæmia is used for tuberculosis of the joints, acute inflammations and suppurations of the extremities, such as acute osteomyelitis, lymphangitis, phlegmon of tendon sheaths, acutely inflamed joints, erysipelas, infected wounds, diphtheria, coryza, inflammatory conditions of the ear, carbuncles, furuncle, mastitis, &c.

There are two methods of producing passive hyperæmia—in the extremities by means of an elastic bandage or rubber ring, which is placed as far above the diseased area as is possible, and then sufficiently tightened to partially obstruct the venous circulation without interfering with the arterial flow. In parts where the use of a bandage is impossible the hyperæmia is caused by suction with a cupping glass made to fit the particular part, but it is doubtful whether this type of hyperæmia is always purely venous. The literature on its application to veterinary practice is very scanty, and it appears that the difficulties of its application are very great. Wolfer, of Rheda, reports two successes attained in the treatment of phlegmonous swellings in the horse and ox, but condemns it as unsuitable for mastitis in cattle. This is peculiar, as it is claimed to be the ideal treatment for this disease in the human female.

The technique of the application of the compression bandage is fairly easily learned, though we have to judge entirely by the objective symptoms in our patients. The most important point is that the bandage must not cause pain; indeed, if any pain be present it should be quickly relieved. This indication is of the greatest possible value, as if the pain be increased—and it very quickly will be if the bandage be wrongly applied—one knows at once that the pressure is too great. On the other hand, if the

pain be not decreased after several hours' application the bandage must be drawn tighter. I do this until it appears to become a little uncomfortable, and then ease it a trifle from that. A useful point to note is that the bandage must not be tight enough to interfere with the voluntary movement of the limbs. The extremity should remain as warm as, or even warmer than, the corresponding one of the opposite side, and the pulse below the bandage should remain clearly perceptible, provided it was possible to record it before the application of the constrictor.

In acute inflammations of the horse's foot the pulse is often perceptible at the plantar artery and then affords a perfect guide. The colour of the skin in light-coloured dogs and white-heeled horses may be some guide, but the warmth of the limb and analgesia are the best helps to me. I should strongly advise anyone before applying this treatment to make first a few experiments upon himself, and he will very quickly grasp the degree of constriction required. I have had surprisingly little trouble in teaching owners and grooms to apply the bandage themselves when once they have had the idea carefully explained to them, and I have not so far had the slightest mishap with the treatment, the only trouble experienced being a tendency to bandage too loosely at first; but I regard this as a fault on the right side, and one which can be quickly remedied.

A few feet of elastic cotton net bandage for horses' limbs and ordinary rubber rings (obtainable at a stationer's) for small animals are most effectual, always padding underneath with plenty of cotton-wool. At first I dispensed with the wool on the horse, but I found that it rendered the process easier to carry out, more successful, and removed all danger of chafing from the bandage.

It has been recommended to bandage obliquely round the limb, not placing the folds directly upon one another, but I find this more difficult in application, and have not myself observed better results from it. An essential factor for success is that the constrictor shall be as far from the diseased area as possible, and no success could be achieved with it applied below the knee or hock. I now apply it round the forearm and the tibia as high as possible to avoid undue pressure on the Achilles tendon. To prevent slipping it is a good plan to fasten a layer of cotton-wool to the hair with some adhesive, so giving the bandage a better bite. In small animals it may be applied above the elbow or the

hock, a ring above the stifle not being successful. It is advisable to fasten the end with strong safety pins as a tape is very apt to slip round, and there is also a danger of tying too tightly.

Dogs appear to tolerate an elastic bandage an inch wide round the neck without showing any signs of discomfort, and though I have not at present any reliable experience, it may be of use in otorrhœa.

The result of the compression bandage is to cause a great slowing and widening of the blood current in the part peripheral to it, thereby producing what one may describe as an artificial inflammation. The partial damming of the blood-stream causes a heightened pressure in the vessels with outpouring of the serum into the tissues and materially helps the emigration of leucocytes. These are present in increased numbers, partly because of the increased quantity of the blood, and partly because they tend to become stationary in the retarded current.

Hyperæmia lessens pain, checks infection, destroys bacteria, and favours absorption and regeneration.

The diminution of pain is one of the most notable effects of passive congestion, and also one of the most useful. The speedy relief of suffering is obviously our duty from a moral point of view, though it is sometimes apt to be overlooked by veterinarians; but, apart from that, it is most conducive to a speedy cure.

Dogs and cats are not so prone to interfere with wounds or injuries if relieved of pain; and in severe foot cases in horses the relief afforded obviates the use of slings, and prevents the appearance of general symptoms due to exhaustion and loss of appetite.

Restive and nervous animals become easier to approach and to dress than before, and I attribute a good deal of the success of hyperæmic methods in animals to this effect. It may be explained by the fact that the outflow of serum lessens the tension in the vessels and washes away diseased products which irritate the nerve terminals, but more probably it is through the serous infiltration of the tissues, which diminishes the sensitiveness of the nerves, as does the infiltration method of anæsthesia of Schleich.

Bactericidal Effect of Hyperæmia.

There is no doubt that congestion hyperæmia has a destructive, or, at least, an attenuating, effect upon bacteria. This has been

proved experimentally, and it has also been shown that the serum from a congested inflamed extremity has greater bactericidal powers than that taken from a normal limb which has been rendered hyperæmic. But more convincing than experiment is the fact that in practice, after the application of the elastic bandage, badly infected wounds quickly become sterile, pus disappears, and hot abscesses if evacuated and properly drained clear up with wonderful rapidity. Many theories have been advanced to explain this action, one being that it is a simple washing away of the bacteria and their products by the increased amount of serum. This doubtless helps, especially in the case of widely open superficial wounds, but it is impossible to explain all cases in this way. Hamburger considers it due to the fact that the congestion hyperæmia makes the blood richer in carbonic acid, which itself is destructive to bacteria, and which renders the serum richer in alkali by its action on the red corpuscles. Congestion hyperæmia, by slowing and widening the blood-stream, causes an increased number of phagocytes to collect in the inflamed area and renders their migration from the vessels easy. They are able to attack the bacteria in great force, and are materially helped by the serum, which contains the specific antibodies elaborated by the system required to deal with the bacteria and render them easy of destruction. It is perhaps better at present to look upon all these actions as helping one another, and not pin our faith to one particular theory to explain the bactericidal action of venous hyperæmia. It has long been known that blood serum by itself has a deterrent action on bacteria and is stimulating to the tissues. Horse serum has been used in human practice with success to induce indolent wounds and ulcers to heal.

The congestion œdema appears to have a remarkably solvent effect on new inflammatory tissue with the exception of epithelium, so that the cicatrix is softer and more flexible than usual, while the exuberant granulations disappear. In one or two cases I noticed an increase in the granulations to a large degree on the first application of the bandage, but after a time this disappeared, and the wound drew up to a perfectly flat scar. A point in connection with this is the advisability of continuing the treatment for some little time after an apparent cure has been effected. If this be done all the diseased tissues will be removed, and in many cases considerable deformity avoided.

A physiological instance of the effect of hyperæmia on scar tissue may be seen in the way in which cicatrices in the vagina of a cow caused by a previous difficult parturition soften and relax at the time of the next calving.

Congestion hyperæmia stimulates the lymphatic system, causing an increased current of lymph which helps to carry away the *débris* from the diseased tissues, and so helps to prevent the formation of an abscess; or, if one is already present, removes its walls after the pus has been evacuated, which must be done thoroughly and promptly if success is to be attained.

Bier describes a rare condition in which the lymph-stream is obstructed, but I have not heard of this being met with in our atients.

During the periods when the bandage is removed the absorption of fluids by the blood-stream is materially increased, and the part under treatment quickly returns to its normal size.

Clinical Cases.

Case 1.—A yellow-coloured, full-grown neuter cat was brought to the infirmary on April 18, 1913, with a lacerated and infected wound on the front of the left metatarsus. The history obtainable was that the cat had sustained the injury three days before, but the exact cause was not known. The wound extended almost round the sides of the foot, only about a finger breadth of sound tissue remaining. The deepest part was in the centre, the extensor tendons of the two middle digits were severed and the bone exposed. The wound was thoroughly cleansed and trimmed and treated with antiseptic dressings in the ordinary way, but the cat was in great pain and refused to allow any dressings to remain in place, constantly licking the wound. For about a week treatment with various antiseptic dressings was tried, but the wound grew steadily worse and began to smell badly.

Considering ordinary measures to be useless permission was asked to amputate, but this the owner absolutely refused. As a last resource I adopted Bier's treatment, placing a rubber ring well padded with wool round the leg above the hock, leaving it on for four hours and off for four hours alternately. On the second day the cat improved in spirits, regained appetite, and ceased to lick the wound. On the third day granulations appeared at the edges, and slowly spread over the surface of the

wound. After the first week the time of bandaging was gradually increased to twelve hours on and twelve hours off alternately. On May 14 the cat was discharged as cured, but was brought back on May 16, the wound having reopened. The owner informed me that the patient had jumped through a half-opened window, catching his leg in the sash. The elastic bandage was again applied, and the cat discharged finally on May 18. I saw the patient two months later, when the scar was completely covered by hair and was hardly noticeable to the touch. The leg is of the normal size, but the two middle digits are slightly dropped. This, of course, was to be expected, as quite $\frac{1}{8}$ in. of each tendon had been destroyed. During the time the hyperæmic treatment was adopted the wound was merely wiped occasionally with a little boric wool to remove accumulated discharge. I am now of opinion that if the ring had been applied for longer periods from the commencement of the treatment healing would have been materially hastened. The case shows well the soothing effect of the hyperæmia, and it is this which made a cure a possibility. The granulations at first were very prominent and I feared a permanently thickened limb as the result, but they were gradually absorbed. The œdema resulting from the pressure of the ring was considerable, but it had always disappeared before the time of the next application. The discharge from the wound was at first thick, purulent, and fœtid, being greyish in colour; but it gradually lost these characteristics, became free from odour, clear and serous. Only once was the ring applied too tightly, but no ill-effect resulted, though the foot was distinctly cold when the ring was removed.

Case 2.—An aged cart mare. When first seen, on August 1, 1912, this mare was very lame on the off fore-foot, with a small wound discharging pus on the outside of the coronet. The history obtained was that she had been gradually getting worse for about a week. The shoe was removed and it was found that there was a separation of the wall from the outside heel nearly to the toe, full of pus, much of the sole being underrun. The separated horn of the sole was removed, drainage provided, and poultices and antiseptic fomentations provided. The foot became worse, four sinuses opening at the coronet, and as the animal was of low value the owner would not consent to a radical operation with its attendant trouble and expense. The animal refused to

put the foot to the ground and was rapidly losing condition. A light shoe was put on and the foot was washed in weak lysol twice a day and wrapped up in sacking after being well packed with tow. The elastic bandage was applied for four hours twice a day. Three days later, though little improvement could be noticed in the foot, the mare placed it firmly on the ground, and had regained her appetite. Owing to the question of expense I only saw the case occasionally, but the improvement was steady, and in about six weeks the mare was put to work. There was a large outgrowth of horn at the coronet, but this gradually grew out, and to-day the foot is normal in shape.

This case when first treated was rapidly becoming a serious quittor which under ordinary circumstances would have been impossible to treat, as the owner refused to give much time to it and I could not pay frequent visits. The bandage caused very little œdema in the limb, which perhaps may be explained by the thickness of the skin in a cart-horse, though there was a greatly increased discharge from the wound at first. This gradually became thinner and less purulent as healing progressed.

The analgesic effect of the venous hyperæmia was well seen in the two preceding cases, where the engorgement of the diseased areas with blood stimulated the tissues to deal with the septic invasion and also to remove the accumulated results of the inflammatory process. In both cases the destructive action of the organisms was at once arrested and healing allowed to commence. I attribute some measure of the success attained to the fact that the comparative freedom from pain allowed the animals to make more use of their limbs than is usual, so preventing the tissues from becoming unhealthy through inaction.

Case 3.—An aged van mare, brought to the infirmary on March 26, 1913. She showed acute lameness of the near fore-leg from a suppurating corn which had been neglected. The feet were flat with weak heels. The inside of the near fore-heel was swollen and very tender and there was much suppuration. The foot was pared out, all underrun horn removed, and a bar shoe fitted. Hot poultices and antiseptic irrigations were ordered. Under this treatment the lameness decreased and the mare was sent to work on April 13. On May 23 she was brought back more lame than at first. The owner had turned her out to grass and had paid no attention to the shoe, which had been left on

and had bruised the heel afresh. On the advice of a "friend" he had applied a cowdung poultice, and there was now a sinus discharging pus in two places at the coronet with much swelling and tumefaction. Free drainage was effected, the sinus being well irrigated with weak chinosol and the foot wrapped in wool and tow and placed in sacking to keep it as clean as possible. An elastic bandage, 3 in. wide, was placed above the knee for twelve hours on and off alternately. Five days later the lameness was not noticeable at a walking pace, the swelling of the coronet was subsiding, and the discharge lessened. Against instructions the animal was worked, with a recurrence of the acute symptoms, but Bier treatment again afforded relief, and the use of the bandage was continued until the end of June. The mare is now working satisfactorily and there is no sign of recurrence, though her heel is deformed and the lateral cartilage is ossifying. I am strongly of opinion that if the correct treatment had been persevered with from the first the cure would have been entirely successful. However, the animal has been made quite useful at comparatively small expense and was able to work much sooner than one would have expected. This case is very similar to the preceding one, but I have described it at length for its economic aspect. The owner was a very poor man, who could not have paid for a long or expensive treatment and to whom the wage-earning power of his animal is a very serious item. He quickly learned to apply the bandage himself and had not the slightest mishap with it.

Case 4.—An aged carriage horse. This patient had large capped hocks of many years' standing. The near one was bruised afresh on April 12, 1913, causing lameness and great swelling of the hock and tendons. On April 13 the bursa was opened and a large amount of pus evacuated. The cavity was irrigated twice daily with chinosol, ½ gr. to 1 oz., but the discharge continued copiously and the swelling of the leg did not diminish. On April 16 the elastic bandage was applied for twelve hours on and off alternately. The inflammation of the tendons at once began to subside and the pus became less copious and thinner. It gradually lessened, the wound healed, and the animal went to light work on April 22. This case well illustrates the bactericidal effect of venous congestion, as it rendered possible the easy and permanent healing of an infected bursa which in the ordinary way proves too often a most difficult thing to subdue.

Case 5.—A three-year-old bay mare, very lame on the off hind-leg, which was much swollen from the hock downward. The lameness had occurred whilst the animal was at grass and had been present for about a week. A definite diagnosis could not be arrived at, but I was of opinion that there was a severe injury in the neighbourhood of the fetlock joint, probably to the upper end of the os suffraginis. Hot applications of china clay paste were applied, but the lameness persisted and four days later the fetlock joint burst on its postero-internal face, synovia flowing freely. The hot applications were discontinued, the wound being dusted with antiseptic powder, and an elastic bandage applied above the hock for ten to twelve hours a day. Under this treatment the discharge of synovia ceased in two days and the lameness decreased sufficiently to allow the animal to walk a little. Bier's treatment was continued for a fortnight, but without any further improvement. I cite this case as it is the only open joint which I have treated, and the bandage appeared to expedite the healing process remarkably.

Case 6.—A three-year-old brown Hackney mare. We were first called to attend her for influenza, from which she made a good and quick recovery. Her owner very unwisely gave her a too liberal diet of oats, beans and wheat, with the result that a severe attack of laminitis in all four feet supervened. The pain was intense and the animal, a very highly strung, nervous mare, bore it very badly. It was impossible to apply poultices to the feet, or, indeed, to interfere with them at all, and she obstinately refused to lie down. All food was rejected and she fought desperately at any attempt to drench her. Her condition became pitiable, and it was with difficulty that the owner was prevented from destroying her. Recalling how the Bier treatment had relieved pain in other cases I, as an experiment, applied elastic bandages to both forelegs, and, rather to my surprise, in less than six hours she quietly lay down and slept for some time, afterwards taking a little food. Recovery from then was steady, though very slow. The bandages were applied for four hours at a time and only if the mare was on her feet. Considering the severity of the case the deformation of the feet is very slight. I regret to say that I have not yet had a similar case on which to try the treatment, but it appears to me well worth a very thorough trial for laminitis.

An improvement in technique would be to keep up the venous congestion for much longer alternate periods and to continue it during and after convalescence for a longer time in order to get the solvent and absorbent effects upon the inflammatory products left in the foot. At first sight any treatment causing an exudate would appear to be wrong in laminitis, but Bier strongly recommends passive congestion in acute inflammations of the human, perhaps the condition most analogous being the acute orchitis of gonorrhœa, in which there is a very vascular tissue enclosed in an inelastic case. The application of a moderate tourniquet to the spermatic cord has most successful results in this condition. In this type of case the bandage should be applied early and for as long periods as possible. A practical point which reduces the difficulty of application is that in laminitis the pulse can usually be felt at the plantar artery. This is an invaluable guide as to the tightness of the bandage, for it is easy to realize that any interference with nutrition would undoubtedly be attended by grave consequences. Although this is not a pure case of treatment by passive congestion (the animal receiving all ordinary general treatment at the same time), I certainly believe that a cure was only made possible by its use and that it may prove to be of the greatest assistance in this painful and unsatisfactory disease.

The above cases are a few in which I have had the opportunity to give venous hyperæmia a trial, but with further experience to guide us it should be applicable to many pathological conditions met with in veterinary practice. Professor Craig has published an account of the successful treatment of hygroma. Messrs. Sampson, Pillers and Irving report success with injuries to the foot, but the literature on the subject in England appears to be scanty.

Lemire and Ducrotoy have used it with success in phlebitis (in which it is contra-indicated in human practice), traumatic arthritis, injuries and wounds of the extremities, lymphangitis and strains of the suspensory ligament and flexor tendons. In the last two conditions my experience so far is unfavourable, and I conclude that to be successful treatment must be commenced very early. In periostitis of the cannon bones from blows it is excellent, and though I have had no opportunity for trial I should suggest the use of Bier's treatment for sore shins or acute splint lameness.

In all wounds or bruises of the extremities it is well worth a trial, but to gain good results the bandage must be applied as far as possible from the diseased area, and pus, if any be present, must be promptly evacuated and good drainage provided. Failure to effect this has been the cause of several failures in my hands, notably one case of infection of the sheath of the perforatus tendon in a hunter.

Venous congestion exercises no preventive effect in cases of interdigital abscess in dogs, but it is useful to allay the acute pain often met with during the formation of the abscess. A rubber ring above the elbow or hock will be found useful in cases of injury to the nail or pad of dogs.

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WILD GAME AS A RESERVOIR FOR HUMAN TRYPANOSOMES.

AN ANALYSIS OF THE AVAILABLE EVIDENCE FROM THE NORTHERN SHORES OF LAKE VICTORIA NYANZA.

BY H. LYNDHURST DUKE, M.D., D.T.M. & H.CAMB.

(Reprinted by special permission from the *British Medical Journal*.)

THE question whether the wild game of the sleeping sickness areas of Africa are acting as reservoirs for the human trypanosomes, *Trypanosoma rhodesiense* and *T. gambiense*, has recently attained great importance. Among the investigators engaged in the biological problems connected with sleeping sickness there are two distinct opinions prevalent. On the one hand some observers —foremost among them the Germans of Lake Tanganyika—are strongly of the opinion that these game trypanosomes, however similar they may seem to the human parasite, are nevertheless non-pathogenic to man; others, including the Royal Society's Commissioners in Nyasaland, and Kinghorn and Yorke, consider

that certain of the trypanosomes recovered from the local game are identical with *T. rhodesiense* of man.

The special aspect of this question which will receive attention here is the part played by the game in the fly area of the northern shores of the Victoria Lake. As is well known, a terrible epidemic of sleeping sickness devastated this part of Uganda Protectorate in the years 1899-1909. The disease was presumably introduced by caravan porters from the Congo, where trypanosomiasis has long been known to the natives. In 1908-9 the native population of the lake shore of the mainland and of the neighbouring islands was removed inland, away from the fly. Since this measure the disease has practically died out in this part of the Protectorate. In spite, however, of the removal of the natives from contact with the wild lake shore *Glossina palpalis*, a certain proportion of these flies are still (1912) capable of infecting monkeys with a trypanosome. The morphology and general behaviour of this organism are indistinguishable from those of *T. gambiense*.

Again, in September, 1911, an exactly similar trypanosome was obtained from the blood of two situtunga antelopes shot on Damba Island, about nine miles from the mainland.* The point to be decided is: Are these "wild fly" and "situtunga" trypanosomes descendants of the *T. gambiense* which caused the recent epidemic, or are they merely parasites of the antelope, and not capable of surviving in a human host? Unfortunately, the decisive experiment of inoculating the organisms in question into man is not feasible in Uganda. There are no local volunteers, and the ethical objections to experiments, however painless, on condemned criminals are insurmountable. All that can be done is to review the whole available evidence in the light of common sense, and to try and arrive at a logical conclusion.

For convenience, the trypanosome obtained from Damba situtunga will be referred to as the "Damba trypanosome." The organism pathogenic to monkeys and derived from wild flies will be called the "wild fly trypanosome." I hope in the course of this brief review to establish the fact that these two trypanosomes are identical; and that both are the descendants, doubtless somewhat modified, of the parasite which caused the recent epidemic.

* *Proc. Roy. Soc.*, B, 85.

The points demanding attention will be considered in the form of a series of questions and answers.

(*A*) *Is there any reason to doubt the identity of the "Damba" trypanosome and the "wild fly" trypanosome?*

I have shown that the morphology and general reactions of these two strains of trypanosomes make it impossible to doubt their identity.* The answer to this important question is accordingly in the negative.

(*B*) *Is there any evidence that the trypanosome of the fly on the mainland and island coasts of Northern Lake Victoria Nyanza is derived from antelope, rather than from hippos, reptiles, or birds?*

(1) The "Damba trypanosome" was obtained in monkeys by direct injection of situtunga blood.

(2) Blood of a considerable number of hippos, birds, and reptiles has been injected into susceptible animals without any trypanosome being discovered.

(3) On islands where there are no buck but plenty of hippos, reptiles, and birds the tsetse are incapable of infecting clean monkeys or goats.

(4) The closer the relations between antelope and tsetse, the greater the percentage of infective flies.

As far as there is any evidence, therefore, it answers this question in the affirmative.

(*C*) *Is there any evidence that the trypanosome of the fly is derived from truant natives?*

In spite of the regulations to the contrary there has been evidence from time to time that a few individuals have visited parts of the prohibited area. Some of these have been arrested; others are, perhaps, still at large. Could these natives account for the persistence of infected fly?

The following considerations make this explanation inadequate:—

(1) There are *very* few such natives.

(2) They do not visit the strips of shore on which the experimental flies are caught, for fear of being seen and arrested by the laboratory employees, who are known to visit these localities regularly in search of fly.

* *Proc. Roy. Soc.*, B, 85.

(3) It is improbable that these truants are sick, as they have of necessity to lead a rough existence and to be constantly on the lookout against capture.

(4) The signs of recent native occupation are usually on the far side of islands, not on the mainland.

(5) On certain islands where definite signs of recent native occupation have been found—for example, huts, ashes, cooking utensils, &c.—and where there are no buck, the tsetse are non-infective. On these islands there could be practically no restriction to the movements of the truants—as regards fishing, &c.—owing to the distance from the mainland. Such islands are Nsadzi and Lwagi. The flies on the neighbouring island of Kome are infective, but here situtunga are common.

(6) Truant natives are notoriously addicted to night fishing in order to escape detection. *G. palpalis* is not active at night.

As regards the canoe men and fly boys employed at the laboratory to obtain flies and pupæ, they are kept under constant observation and have never shown any signs of sleeping sickness. Both blood inoculation into monkeys and the examination of fresh slides were employed at frequent intervals.

It is plain from the facts here given that antelope are probably the chief reservoir for the "wild fly" trypanosome.

(*D*) *Is there anything in the morphology and general behaviour of either of these lake shore trypanosomes which proves that they cannot be identified with* T. gambiense?

The morphology and animal reaction of these trypanosomes correspond closely with what is known of *T. gambiense*. They cause a more or less chronic disease in monkeys and rats, and are unaffected by human serum.

The data relating to the animal reactions of the human strain of trypanosome obtained from Uganda natives by the Royal Society's Commission at Entebbe show that the disease at the first inoculation was slightly more chronic. Thus white rats lived for three or four months, paralysis of the hind quarters being observed before death in some, but not all, experiments. In four uncomplicated monkey experiments, in which the animals were inoculated directly from human beings, the average duration of the disease was 184 days—the maximum being 250 days, the minimum 107 days. In four monkey experiments with the Damba trypanosome the corresponding figures were 172, 207, and 144 days.

Four monkeys experimentally infected with the "wild fly" strain (1910-11) lived for an average of 114 days (maximum 147 days, minimum 85 days; this last monkey was an old emaciated animal at the commencement of the experiment, and cannot, therefore, be looked upon as a fair test of the pathogenicity of the trypanosome). A single monkey experimentally infected with wild fly trypanosomes at Entebbe, in 1904, lived 214 days.

A white rat subinoculated from a rat infected with human blood by the Entebbe Commission died in two months and a half without any paretic symptoms. The average duration of the disease in six white rats inoculated with the "Damba trypanosome" was 61 days (maximum 74 days, minimum 44—a very young animal). Similar figures were obtained with rats inoculated with the "wild fly" strain. It should be noted that the trypanosomes in these Mpumu rats had in each case undergone previous passage through monkeys. Some of the rats showed paralysis of the hind quarters before death, others did not.

It will thus be seen that the general behaviour of the Damba and "wild fly" trypanosomes in monkeys and rats resembles that of the *T. gambiense* obtained in 1903 directly from infected natives. Guinea-pigs were more refractory to the human than to the two recent lake shore strains. It must be remembered, however, in this connection that when originally tested by Bruce and his collaborators *T. pecorum* was non-inoculable into these animals, though it subsequently proved pathogenic. If such a modification can occur in a trypanosome in the course of a few months at the laboratory, much stress cannot be laid on this difference. For if the human trypanosome were excluded from the blood of man for several years, it might be expected to show a change in its behaviour towards other hosts.

The answer to this question appears to be, therefore, that not merely is there no good evidence to show that the Damba and fly trypanosome is not identical with *T. gambiense*, but that there is a certain amount of evidence to show that it is identical.

(E) Are wild antelope of the species frequenting the lake shore inoculable with the human trypanosome? And if so, does the parasite persist for any length of time in their blood, or is it rapidly fatal?

The experiments initiated by the 1908 Commission of the Royal Society at Mpumu show conclusively that clean bushbuck, reed-

buck, and waterbuck are inoculable with a strain of trypanosome derived from a native patient. Subsequently, at the same laboratory, a duiker and a situtunga were similarly infected.

I have shown* that the trypanosome was recoverable from one of the antelope twenty-two months after the original inoculation. Some of the antelope experimented upon ceased to give any evidence of infectivity long before this period had elapsed. Two others were proved to be still carrying the trypanosome fifteen months after inoculation. During the whole period of observation the animals showed excellent health, and on several occasions conceived and gave birth to healthy young at the laboratory.

There is some evidence to show that those animals which have ceased to give evidence of infectivity have acquired a resistance to reinoculation. On the other hand, this is no reason to suppose that the animal which gave a positive result after twenty-two months is not still infective.

The laboratory antelope, therefore, show that the wild lake shore game may act as a reservoir for the human parasite for at least twenty-two months, and during this time experiments have proved that they are relatively well adapted to infect fly with *T. gambiense*.

Given, therefore, a number of fly and antelope in a district, there is nothing to prevent the infection with *T. gambiense* being kept up indefinitely.

The answer to this question furnishes, therefore, indirect confirmation of the conclusions arrived at in the case of the preceding question.

(*F*) *Is the evidence available on the subject of the infectivity of the wild fly to the "wild fly" trypanosome such as would lead to the conclusion that this trypanosome is an antelope parasite, or that it is a descendant of the* T. gambiense *which caused the recent epidemic?*

The following table shows the available data on the subject of the fly infectivity.

These more or less random figures, taken at long intervals, have but little real statistical value. A number of uncontrollable factors affect their precision. Migration of the fly, the relatively

* *Proc. Roy. Soc.*, B, 85.

Period	Locality	Number employed		Number of infected flies	Percentage of infected flies		Remarks
		Fed	Put on				
May to July, 1903	Entebbe mainland	989-1,360*	—	3	0·30-0·22*		Natives present infected 1 in 3 or 4. No antelope
September to November, 1903	,, ,,	1,421	—	1	0·07		Natives removed. No antelope
June to September, 1904	,, ,,	2,299	—	0	0·00		No natives; no buck
November, 1908, to April, 1909 ...	Mainland, Buka Bay	6,106	10,022	4	0·065	0·039	Antelope available
May to September, 1909	,, ,,	3,151	5,920	7	0·22	0·11	,, ,,
November, 1909, to February, 1910 ...	,, ,,	9,878	—	4	0·04	—	,, ,,
March to June, 1910	,, ,	8,813	—	3	0·03	—	,, ,,
August to November, 1910	,, ,,	—	22,784	4	—	0·017	,, ,,
December, 1910, to March, 1911 ...	—	—	28,294	1	—	0·003	,, ,,
April to August, 1911	—	—	18,939	3	—	0·015	,, ,,
October to December, 1911	—	—	9,340	1	—	0·010	,, ,,
January to June, 1910	Damba Island	6,356	—	2	0·031	—	,, ,,
May, 1911	,,	885	—	1	0·11	—	,, ,,

* In these early experiments the monkeys were examined only at intervals of seven days. As batches of flies were being fed daily it is therefore impossible to estimate accurately the number responsible for each infection.

small number examined, and the impossibility of recognizing more than one infected fly in any given experiment, all demand due consideration. In spite, however, of the theoretical sources of fallacy, these infectivity experiments do undoubtedly supply an index to the state of affairs on the deserted lake shore. As the figures may be quoted, it is as well to determine what conclusions can be drawn from them as they stand—assuming them to be valid.

The first three experiments of this table deal with wild flies caught at Entebbe by the first Commission of the Royal Society. Hut-tax labourers were encamped on the lake shore close to the place where flies were caught. Other flies were obtained from the shore line or the Botanic Gardens. No antelope would be available to these fly, as the constant presence of natives had long driven them away. Hippos and crocodiles, however, were common. The tax labourers were removed during the second of these three experiments.

It will be noticed that the infectivity of the flies diminished with the withdrawal of the infected natives. These hut-tax labourers were infected to the extent of 1 in 3 or 4.

Regarding the subsequent experiments, it must be noted in passing that there is a considerable difference between the number of "flies fed" and the number of flies "put on." In Sleeping Sickness Report XIII an experiment was given to show that mere introduction of the proboscis of an infected fly is sufficient to infect a monkey, without any actual blood-sucking. The earlier Commission only counted those flies which had sucked so much blood that it was visible in them to the naked eye, and therefore it is possible that the total numbers of flies given may be too low, and the percentages of infected flies too high. For supposing an infective individual of a given batch of wild flies had merely inserted its proboscis, or had taken only a minute quantity of blood, it would have been rejected in the counting as not having fed. In comparing percentages, it is therefore necessary to bear this point in mind, if both classes of data are not available. In considering the figures for 1908-09 it must be recollected that from November, 1908, to September, 1909, a large number of natives were still present in the fly area, as the island populations were not removed until August and September, 1909. The spot where the flies were caught is almost directly in the line

taken by canoes from the heavily infected island of Damba to the mainland landing places. If, therefore, the " wild fly " trypanosome of the recent experiments is, in spite of presumptive evidence to the contrary, a true antelope trypanosome, then these 1908 and 1909 flies would be harbouring *both this antelope organism* and *T. gambiense*, for both are capable of development in the fly. It would accordingly be reasonable to expect that the flies of this period—an interregnum between the old and new conditions—would show a high percentage of individuals which could infect monkeys. The figures are, however, 0·039 per cent. to 0·11 per cent., which, it will be noticed, are lower than those reached at Entebbe, where only *T. gambiense* was available for the fly.

After the removal of the natives from the islands the percentage drops somewhat, as would be expected, but a considerable number of flies still retain their infectivity to monkeys. It will be seen that the figures from March to June, 1910, do not differ appreciably from those obtained while infected natives were still available to the fly. Subsequently the percentage decreased slightly to the 1911 level of 0·01.

From section *J* it would appear that if the " wild fly " trypanosome were an antelope parasite like *T. uniforme* or *T. vivax*, there would be a rise in the percentage of infected flies on the removal of the natives, and not a fall. This argument is based on the presumption, supported by facts quoted below (*J*), that a trypanosome indigenous to antelope will be more readily transmitted by the local tsetse than a newly introduced human organism.

It is remarkable that the percentage of infected flies in Damba Island in May, 1911, is actually higher than it was shortly after the removal of the natives. This might at first sight suggest the presence of a true antelope trypanosome. The conditions of this island are, however, unique. Situtunga are exceedingly numerous, and since the departure of the natives they are frequently seen on the strip of shore where the flies are caught. In former times this particular beach was backed by a large village, so that the antelope would seldom or never reach the water's edge at this point. Unfortunately, no details are available concerning the infectivity of Damba flies to *T. vivax* and *T. uniforme*. From inoculation experiments referred to below (*I*), it is probable that relatively large numbers carry these trypanosomes. In any case,

since the removal of the natives the frequent presence of antelope on the fly shore will ensure a greater proportion of the fly being infected with any suitable trypanosome which the animals may have in their blood. It will be noticed that, in spite of the exceedingly favourable conditions for the spread of the antelope trypanosome among the fly of this Damba beach, the percentage of infected flies is only slightly greater than that reached with *T. uniforme* and *T. vivax* on the mainland. Here far fewer animals reach the fly during their biting hours. In other words, the evidence of this section tells against the deduction that the "wild fly" trypanosome on the Damba Island is an antelope parasite and not *T. gambiense*.

(*G*) *Is there in Uganda any species of trypanosome, other than* T. gambiense, *with which the "Damba" and "wild fly" trypanosome can be identified?*

The antelope trypanosomes, *T. vivax* and *T. uniforme*, have been recovered from cattle in Uganda. It is reasonable to suppose that if the trypanosomes discussed in this paper were genuine antelope parasites they would have been recovered from domestic animals by one or other of the Commissions. There is, however, no trypanosome strain known in Uganda the animal reactions of which correspond with those of the lake shore organism, except *T. gambiense*.

The evidence of sections *F* and *G* is thus in accordance with that of the previous sections.

(*H*) *Is there any evidence that a mammalian trypanosome could persist in wild flies for years without some mammalian intermediary?*

In this connection three points demand consideration—that is, (1) Longevity of the fly; (2) hereditary transmission of the trypanosome from the parent fly; (3) infection of one fly from another by contaminated feeding.

Longevity of the fly will not alone explain the continued infectivity. So far no one has proved that *G. palpalis* is capable of surviving for one year. Hereditary transmission, though obviously difficult to exclude by experimental proof, has never been known to occur. Experiments conducted on this point by the Commissions of the Royal Society have always proved negative.

Experiments carried out at Mpumu laboratory have always

failed completely to support the theory that there is any transmission of trypanosomes among *G. palpalis* by contaminated feeding.

There is, therefore, no particle of evidence to justify an affirmative answer to question *H*.

(*I*) *In the prohibited lake shore area what is the proportion of wild antelope which is infected with* T. vivax *and* T. uniforme *—that is, genuine antelope trypanosomes non-pathogenic to man, and carried by* G. palpalis?

There is no reason to suspect any one species of antelope of being more or less immune to these trypanosomes.

Considering first the mainland antelope:—

In 1909 five bushbuck were shot and the blood examined microscopically. In two cases the blood was subinoculated into goats, animals susceptible to *T. vivax* and *T. uniforme*. One of these antelopes was found to be infected with *T. vivax*, which appeared in the subinoculated goat. Examination of blood slides alone is insufficient to determine the percentage of infected antelope. Three of these five bushbuck were not proved, therefore, to have been negative. At the time of these experiments *T. uniforme* had not been recognized as a species distinct from *T. vivax*, and it is quite possible that had it been present it might have escaped detection. In taking the percentage of infected animals we find, therefore, that at least 20 per cent., and possibly more, carried trypanosomes. The small number of buck examined deprives these figures of much value. In comparing them with others it must be remembered that the animals were shot near Kibanga, at a place where the fly are fairly common.

From August, 1910, to March, 1911, thirty-two antelopes were examined by subinoculation of their blood and by slide examination. *T. uniforme* was detected on three occasions (9·37 per cent.).

From April, 1911, to September, 1911, twenty-three antelopes were fully examined, and *T. uniforme* obtained in two animals (8·69 per cent.).

Antelope shot on the islands:—

In 1911-12 twenty-one situtunga were examined, and three were found infected (14·2 per cent.). Thirteen of these animals were tested by blood examinations only, and this fact must be borne in mind in considering the percentage. Of the eight

animals tested by both blood examination and subinoculation into goats, three were found infected with either *T. vivax* or *T. uniforme* or both. This gives a percentage of 37·5.

Thus at least 10 per cent. of the mainland antelope and 14·2 per cent. of the island situtunga examined were infected with *T. vivax* or *T. uniforme*, or both these trypanosomes.

In reviewing these data it must be remembered that the antelope frequenting the lake shore are limited in their range. Individuals became associated with certain localities. Time and again some easily recognizable animal will be disturbed in its special haunt—a clearing in the forest, a sandy bay fringed with ambatch clumps, or some bare peninsula with forest at its base. For this reason it seems highly probable that certain animals in the prohibited area and on the mainland are much more frequently exposed to fly-bite than others. Unfortunately, the neighbourhood of the fly areas on the mainland is very unfavourable to shooting. A number of the antelope shot were obtained in places where fly are scanty. On the islands, on the other hand, where only situtunga occur, the probability of any given animal being subject to fly-bite is greatly increased. This would account for the higher percentage of infected buck on the islands than on the mainland.

(*J*) *What is the percentage of wild lake shore flies infected with* T. vivax *or* T. uniforme?

From August to October, 1909, 6,750 mainland flies were fed upon healthy goats, and *T. vivax* was obtained on four occasions; that is, 0·05 per cent.

In March, 1911, 1,320 mainland flies produced *T. uniforme* once and *T. vivax* once. This gives a percentage of 0·15 of wild flies infected with antelope trypanosomes. The actual percentages for *T. vivax* and *T. uniforme* respectively were 0·08 and 0·09. From May to September, 1911, 3,880 flies produced four infections, *T. vivax* appearing once and *T. uniforme* three times. This gives a total percentage of 0·103 infected with antelope trypanosomes, and a specific percentage of 0·02 and 0·07 for the respective organisms.

It must be borne in mind that in dealing with a goat which has been infected with *T. uniforme* by wild flies it is sometimes very difficult to decide whether *T. vivax* is or is not also present in its blood. This latter trypanosome may, of course, be found

in stained blood slides, or it may be obvious in the fresh blood if present in sufficient numbers. *T. uniforme* is also, however, often exceedingly active in fresh blood. In cases—and they are common—where trypanosomes are scarce in the goats it is often extremely difficult to exclude a double infection of both *T. vivax* and *T. uniforme*. For this reason the percentages given above for *T. vivax* probably err on the small side. From the above figures it will be observed that there is apparently no appreciable reduction in the percentage of wild mainland flies infected with these undoubted antelope trypanosomes. On the contrary, there is an increase over the figures obtained in the earlier experiments. This might be expected from the altered conditions on the lake shore. Since the removal of the canoe-man population game of all sorts can wander undisturbed throughout the fly zone. Formerly the numerous villages and the constant passage of canoes would have compelled the animals to drink during the dark hours. For this reason the antelope will now be more frequently exposed to fly-bite. It is remarkable how frequently a fly-infested strip of coast-line is near the site of a deserted village. In such situations it is highly probable that the fly had small occasion to search for wild quadrupeds as long as the villages remained occupied.

Now, however, these old shambas offer many attractions to buck of various kinds, and the fly are still apparently as numerous as ever. If, therefore, the "wild fly" trypanosomes under discussion is an antelope trypanosome pure and simple, it is difficult to see why it should not follow the example of *T. vivax* or *T. uniforme*. On the other hand, if, as I maintain, it is descended from the *T. gambiense* of the recent epidemic, then the difficulty vanishes. The human trypanosome would not presumably be so well adapted to circulation among buck as a parasite proper to antelope. Certain of the laboratory antelopes have proved relatively resistant to *T. gambiense*. Bushbuck 2,328 and waterbuck 2,378 have given no evidence of infection since the fourth month after their original inoculation with a human strain.* The same idiosyncrasies doubtless obtain in Nature. Then, again, there is evidence to show that *T. gambiense* is less suited to development in *G. palpalis* than are *T. vivax* and *T. uniforme*. In experimenting on the transmission of *T. uniforme* with

* *Proc. Roy. Soc.*, B, 85.

laboratory-hatched *G. palpalis* a relatively enormous proportion of the flies used developed flagellates.* In four experiments in which 293 flies were used 56 became infected, or 19·1 per cent. Similar experiments by the 1908-10 Commission with *T. vivax* gave a percentage of 20·1 of the flies used becoming infected with the trypanosome. The Commission gave 5 per cent. as the approximate corresponding figure with *T. gambiense*.

Under the circumstances antelope infected with *T. gambiense* would only be found where the conditions are especially favourable to the exposure of a large number of animals to fly-bite. Such a locality is Damba Island, and it is remarkable that two out of four young situtunga shot on this island should be found infected with a trypanosome answering to all available tests for *T. gambiense*.

It will be seen that the trend of the evidence of these two last sections in conjunction with sections A and D is strongly in favour of the assumption that the "wild fly" trypanosome is indeed *T. gambiense*, not a purely antelope trypanosome.

Finally, it is contended that the available evidence justifies the conclusion that the trypanosome recovered from the Damba situtunga and from the wild *G. palpalis* on the islands and the mainland coasts is a descendant of the *T. gambiense* of the epidemic.

The figures quoted are regrettably small, and doubtless arguments can be advanced on the other side which are unanswerable by direct experiment. The presumption, in the earlier days of the Uganda Commission, that these trypanosomes were identical with the organism of sleeping sickness, seemed so justifiable that no systematic attempt was made definitely to establish the point beyond reach of criticism. It is probable that the behaviour of these trypanosomes has been altered in the meantime by their sojourn in ruminant blood. Nevertheless, the crucial point now is: Are they still pathogenic to man? And to this query only a series of experimental inoculations into man can supply the answer.

* Fraser and Duke, *Proc. Roy. Soc.*

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SWAMP CANCER—EQUINE GRANULOMA.*

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History.—The first appearance of this equine disease, known commonly as "swamp cancer," but correctly designated as "equine granuloma," in Australia cannot definitely be stated.

It is probable that it first appeared soon after the introduction of horses into the tropical parts of Queensland, spreading into the Northern Territory and farther into the northern parts of Western Australia.

As far as records show the disease is confined to the northern tropical parts of Australia. Speaking broadly, the parts of Australia where the disease is known will be found to correspond fairly closely with the areas subjected to a heavy tropical rainfall, and where the seasons of the year are divided into two well-marked periods—the wet and the dry.

The diseases which appear in other tropical parts, described under the name of Leeches, Bursattee, borsartige Schimmel-Krankhel der Pferde, do not correspond with "swamp cancer" from the description given by the various investigators, with the exception of the first named.

Though the diseases so described appear to be associated with the rainy season, characteristic features differ so widely that the identity of the two diseases with "swamp cancer" cannot be easily established.

The disease in India, described by Smith and Steel, and in Sunda Islands, by de Haan and Hoogkamer, shows lesions which consist of firm nodules below the skin, particularly in the lips, alæ of the nose, eyelids, and the mucosa of the mouth. No such features are ever seen in the equine granuloma here.

Dawson, of Florida, however, under the name of "Leeches," describes the disease characterized by the formation of tumour-like masses with some of the features of actinomycosis; further, in the granulation tissue, yellow bodies with root-like projections are found. He observed the condition in horses only.

It would, therefore, appear that the Australian disease is distinct from the Indian and the Asiatic condition known as

* Abstracted from the Veterinary Report of the *Bulletin* of the Northern Territory, Australia.

bursattee, &c., and in all probability identical with the Florida disease "leeches."

The question naturally arises whether "swamp cancer" is an introduced disease, or whether the causative agent is a habitant of swampy parts, living a life apart from the animal, and appearing in the horse as an unusual or accidental phenomenon.

Unfortunately, records are not obtainable giving the locality of the first occurrence, and though the disease has been well known in Queensland for many years, it cannot be definitely decided in which portion of Australia the disease first appeared.

As Dr. Gilruth has shown in his investigations on the introduction of "redwater," stock reached the northern portion of Australia in the early part of last century—about 1820-1824—many years before Queensland was even sparsely stocked. Among the stock introduced for the military settlement at Port Essington were a number of Timor ponies, but if the same explanation can be accepted for swamp cancer as regards introduction as for the entrance of "redwater," that is, through the introduction of stock from Indian islands, much of the mystery could be cleared up. The fact that wild Timor ponies are found with swamp cancer lesions perhaps strengthens the argument. If, on the other hand, the explanation of introduction cannot be taken, then it has to be accepted that the causative agent is native of Australia.

The time of the year when the disease most commonly appears is at the beginning of the wet season, which lasts from October till April, sometimes setting in early, at others appearing in the animal near the end of the season.

The localities where the disease is met with are low-lying, marshy grounds, usually dry during the dry season or drying up so as to leave nothing more than an isolated pool here and there. It is not usual to associate the disease with those water-holes known as billabongs, generally of some depth. The more likely places are the lagoons, harbouring weeds, reeds, &c., and seldom more than a few feet deep. It is in such places, to escape from the attacks of the flies, and where the disease is contracted, that the horses make for, standing up to the abdomen in water from sunrise to sunset. It is on the parts accessible from the water that swamp cancer is usually seen, or on parts that can be easily reached from the water. These parts include the legs, the under

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surface of the abdomen, the inside of the thighs, but lesions are rarely seen higher than the elbow-joints. The neck, head, back and rump are rarely, if ever, affected.

Just a word about the transmission of the disease by means of flies. One strong point in opposition of this theory is that the position of swamp cancer and the parts mostly attacked by flies do not agree. The head, especially below the eyes, the front

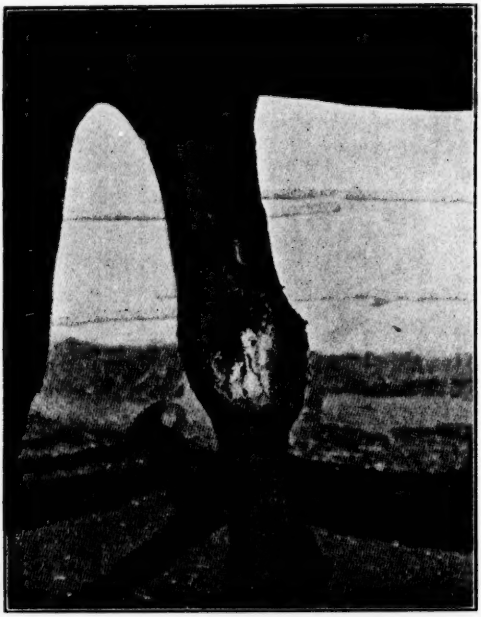


FIG. 1.—Active lesion of knee, three to four weeks' duration. Purulent and sanguineous discharge. No pain present. Lameness shown due to mechanical interference with joint action.

of the nose, the under surface of the neck, and the chest are the parts attacked by diptera just as much as the legs and abdomen, and, incidentally, rarely, if ever, cancer affected.

The disease is one of external infection, the "cancer" being the lesion of the local infection. There is no history of spread from the primary focus to parts at a distance, for a horse infected with a solitary growth, and removed to a locality free

from the disease, will not develop more growths, though the lesion may increase in size. Secondary growths are never found in the internal organs. There may be as many as thirty growths on a single animal, each representing a separate infection. Recovery from cancer in one year in no way means immunity to further infection. An animal may be infected and cured for years in succession. No tendency to the disease is inherited, and no immunity is inherited by the foal from a cancerous mare. The disease is not one of infection through the alimentary canal. Horses habitually bite the affected part if it is within reach, yet no internal infection results, and no spread of the disease is seen in the mouth, though wounds exist due to dental troubles.

A foal may, with no risk of infection, suckle from a mare suffering from a cancer affecting the greater part of the udder. Feeding experiments with the disease's tissues have failed to reproduce the disease in non-affected horses running on the same pastures.

Entrance through abrasions is a possible theory, but is overwhelmed by the evidence that, though biting and sucking the lesion is common, no case is known of a cancer originating in the mouth. Attempts to artificially produce the disease through an abraded surface with material from a cancerous lesion at all times failed.

No age is more disposed than another; no variety nor sex of animal more likely to be affected than another. The Timor ponies running wild in the Territory are not immune to the disease. Cancerous animals at the onset of the disease show no inconvenience by the presence of the tumours, even when in the vicinity of joints; lameness is not usually seen except where the growth is mechanically the cause.

There is no pain or tenderness about the lesions, though an itchiness is shown by continual rubbing or licking of the affected parts. Though not noticeable in the early stages, a general falling away takes place when the tumour attains any size, the animal looking miserable, poor, and not thriving, although eating well.

A feature of considerable interest and of importance when viewed from the experimental point of view is the fact that there is a well-marked disposition on the part of the lesions, whether on the abdominal region or situated on the limbs, to dry up and

vanish when the affected animal is removed from the pasture and placed in the stable on dry feed.

It is certainly apparent that if tumours of years' standing are influenced or disappear by alterations in diet, the artificial production of the lesion will be a matter of great difficulty if carried out in a stable.

The course of the disease depends to a great extent on its position. The affection low down on the leg—those which are in a position where they can envelop a limb, denuding the bone and vessels as tendons, arteries, nerves, &c.—are most likely to be followed by unfavourable results, and then death ensues, if left to the extremity, from the toxæmia more than from the growth itself. Those lesions which, from their position, have a large area over which to spread without involving important tissues, and where the firm fibrous tissue which always forms in response to the inflammation cannot interfere with important parts, are the most favourable as regards prognosis.

If left to itself the course of the disease at the onset is extremely rapid, growing from a small red point to six inches in diameter in the course of a week. The fibrous tissue reaction is intense, especially when the acuteness of growth is considered. In a year's time, if the animal does not succumb, the tumour may be of any size, the largest being seen on the abdomen, firm, fibrous, not yielding to the touch, the external surface bossy, with points or broken-down areas, and usually a serous discharge, often purulent and ropy, continually exuding from the surface.

Taking the disease on the whole, it cannot be said to be generally fatal. Innumerable instances are to be had of an animal in a condition so far advanced as to be worthless, and turned out in the bush to take pot-luck, brought in after a period of one or two years without more than a scar to mark the site of the former lesion. The effects on the limbs, especially near the foot, generally result in some more or less permanent injury. Those which involve the coronet are the most serious, the hoof being usually lost in the process, and, as a rule, some deformity remains.

The course of the growths is very uniform; all are acute at the onset, and all terminate in chronic fibrous tumours. All the abdominal tumours are the superficial variety, all the others on the limbs are the deep-spreading growths. The growth never

invades bone, thus differing from actinomycosis. Muscle tissue is not invaded, although extensions may have occurred into the connective tissue between the muscles.

The lesion is one confined in nearly all cases to the subcutaneous connective tissue, and is freely movable in the early stages, though becoming firm when any size has been attained.

Naked Eye Appearances.—The first evidence of the growth of a cancer is a small, red, slightly elevated area, about a centimetre in diameter, becoming suddenly denuded of hair.

The lesions are rarely observed in the earliest stages; and some degree of growth is usually acquired before observation is commenced. As a rule, when first seen, the growth is about from 3 to 5 cm. in diameter, and the surface is broken down, showing a granulating, red, uneven face, which bleeds freely on interference. Small yellow caseous bodies can be seen throughout the ulcerating surface, and around the circumference, where the lesion is actively spreading, a circle of these bodies in the form of a thin line indicates the progression of the affected tissues. These caseous bodies, afterwards referred to as "roots" of the cancer, are very characteristic of the lesion, and, though of necrotic nature, are firmly attached to the surrounding fibrous tissue.

The surface of the lesion is always raised from the surrounding tissues, the elevation extending into the apparently unaffected skin. The growth extends subcutaneously around the periphery of the lesion, growing very rapidly; it may be, when first seen, a few centimetres in diameter, and as large as 10 cm. across in six weeks' time. No limit to size seems to exist. When the growth reaches the latter dimensions, the acuteness and rapidity of extension is lessened, and some attempt made at repair. Further extension is often seen where growth occurs subcutaneously, breaking down of skin only taking place at fluctuating points. These points give the bossy appearance to the chronic lesions. When a point has broken out and discharged the purulent contents of a small cavity lying below the dermis, the opening closes and heals, to be opened by further discharge at a later period. As before stated, growths of greatest chronicity are seen on the abdomen, where the surface allows of great extension. In some cases the greater part of the lower abdominal surface is covered with cancerous tissue, spreading

XUM

at some points, and healing at others. This spontaneous recovery nearly always occurs after the chronic stage has been reached. It is probably due to the intense fibrous tissue reaction encapsuling the area containing the causative agents of the lesion. A permanent blemish of scar tissue and the absence of hair always remains as the result of the lesion.

If careful examination be made of a cancer lesion at the earliest recognizable stage, it will be found to be a red, oozing area, denuded of hair, standing out from the surrounding tissues.

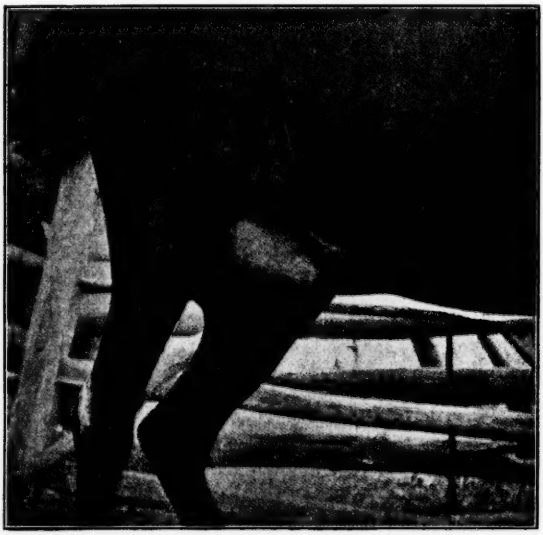


FIG. 2.—Chronic growth in the udder of mare, six months' duration. Almost complete absorption after a period of three months' stabling.

The caseous areas are seen in the earliest stages, and are diagnostic of the lesion. If such lesion be excised, it shows that the tissues involved are confined to the skin proper, without even extension into the subcutaneous connective tissues, though marked thickening may have occurred. As the diseased area increases in size, the surface breaks down into an oozing, granulating mass, with a serous discharge, containing caseous material. In the larger lesions the tumour-like condition is seen, large masses rising abruptly from the level of the surrounding

tissues, either covered with skin or having a surface of oozing, granulating tissue. Attempts at healing are seen when the acute nature has passed off and the subcutaneous connectives are involved, showing an intense fibrous tissue reaction.

In the growths of two and three years' standing the lesion presents quite a different appearance, though retaining the chief features. In these, which are seen mostly on the abdomen, the whole of the skin covering the lesion has not broken down. The fibrous tissue may have attained a thickness of two or three inches over a large area beneath the skin, and contain many small cavities, which are continually breaking out on the surface of the lesion, discharging serosanguineous material containing the caseous masses. When the contents of the cavity are discharged, healing takes place. The bossy surface of the old lesions is due to many cavities immediately below the skin, each boss representing a fluctuating point ready to break and discharge, and leaving, on healing, a small white scar devoid of pigment or hair.

Those lesions which occur on the abdomen spread over most of the undersurface without involving any deeper tissues or interfering with any important structures. When on the legs, the tumour is often more serious, especially in the vicinity of joints or near the foot. The growth often completely surrounds the lower part of the leg, and as the circumference of the lesion increases in size, bone and tendons may be laid bare. Pain is not apparent, and rarely lameness is shown, though growth may be deep down, between the flexor tendons.

When near joints a mechanical lameness may be present, resulting from interference with the joint action.

The mammary gland is often affected in suckling mares, and also in fillies which have never been in foal. Enlargement of the gland is marked, the nipples appearing as if the animal were suckling. Blood-vessels in the neighbourhood are always distended and prominent.

Mention must be made of the characteristic odour of "swamp cancer lesion," which is always present and very noticeable. It is a sickly serous smell, and perhaps somewhat similar to the odour of a pleuro-pneumonia lung during the acute stage.

If a cross section of a growth be made during the acute stage

numerous foci will be seen scattered through fibrous tissue. The foci vary in colour and size, according to the stage of development.

The first indication that a focus is to be formed is a small hæmorrhagic area of about half a centimetre; this increases in size to 2 to 4 cm., when a small necrotic centre can be observed. Later, definite necrotic areas with hæmorrhagic zones can be seen, the red zone gradually becoming paler, until only the necrotic area is left surrounded by fibrous tissue.

The older foci are sections of this caseous material, which appears to occupy sinuses through the growth, and form, when extracted from the tissues *en masse*, branching objects, which are referred to by stock owners as the "roots" of the cancer. The caseous branching objects are used by laymen as an indication of the depth to which the infection has spread. In removing the growths, excision deep enough so as not to leave any portion of such roots remaining generally means cure.

Between the numerous foci is fibrous tissue, firm and bleeding freely when cut. I have observed no calcareous deposit even in the oldest lesions, though in the disease "Leeches," of America, calcification of caseous areas is frequently found.

Microscopic Appearances.—Sections made from early lesions, taking it that infection lies at the spreading edge where normal and diseased tissues meet, and where the line of progressive caseation is seen, are the most important for microscopic examination. Sections of the older chronic lesions show little more than dense fibrous tissue and scattered caseous areas. If examined under the low power, a section through the edge of an actively spreading ulcer shows that there is a well-marked line dividing the diseased from the healthy tissue, and that the growth of the lesion is preceded by a breaking down of epithelium of the *rete malphigii*, and particularly around the hair follicles. The epithelial cells have lost their outline, and stain badly, while pigment can be seen scattered through the tissue where the cells have become disintegrated.

The subcutaneous connective tissue appears crowded with migrating leucocytes of the polymorphonuclear variety, and though a small percentage of eosinophiles are present this variety is at this stage comparatively absent to the well-marked infiltration which is seen in the more chronic lesions.

Throughout the breaking down epithelium numerous foci are present which simulate miliary abscess formation. These foci vary in size from mere groups of leucocytes to foci which consist of a wide zone of polymorphs around a necrotic area.

The tissues affected are firstly the skin, and secondly the subcutaneous connective tissue in which the fibrous mass of the new growth forms. Bone is never invaded nor muscular tissue, and it is rare to find the lesion invading even the connective tissue between the muscles themselves.

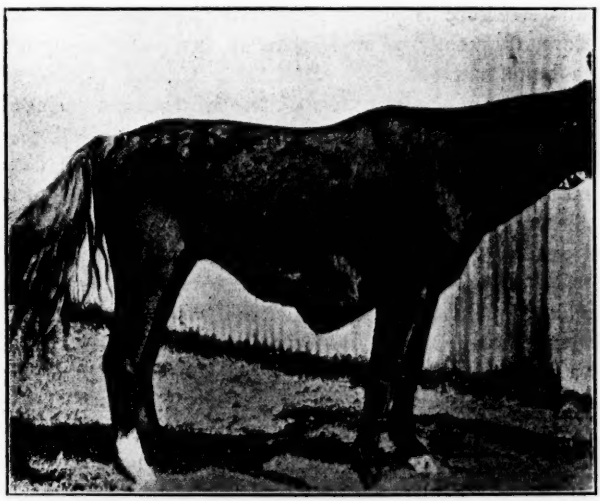


FIG. 3.—Chronic lesion on abdomen of four years' duration; firm, unyielding, surface bossy, with small breaking down areas. Almost total absorption on stable feed.

Careful observation has been made, without success, for intracellular parasites, but neither the surface epithelium nor that of the hair follicles, or the sebaceous glands, show the presence of any parasites in the form of organisms or fungi to account for the leucocytic invasion that is so well marked in these areas, even in the earliest lesions of the disease.

Early foci formation is seen among the broken down epithelium and in the vicinity of hair follicles. What determines such formation cannot be demonstrated with the microscope.

Scrapings of tissue and contents of foci from active lesions

when examined in the fresh condition exhibit no motility on examination, and no spirochætes can be demonstrated by refraction methods.

Apart from the foci, the sections correspond to those of actively granulating tissue. The fibrous tissue reaction is active and always well marked. Sections of chronic lesions show a dense infiltration of eosinophiles, with scattered caseous areas, but no marked phagocytic reaction.

It need hardly be noted that the term cancer given to the disease is not based on its microscopic structure. No carcinomatous structure is present, and the spontaneous recoveries which are frequently seen remove it from the category of malignant tumours.

In the human being the conditions with which eosinophilia are associated are well known; asthma, verminous infections, and eczema being the principal diseases. With the equine disease, the presence of parasites, either metazoon or protozoon, is naturally suggested where eosinophilia is so well marked, but careful examination of the blood shows that the increase is not a general one, and that the eosinophilia noted in the lesion is a local infiltration, and, further, the more chronic the lesion, the greater the degree of eosinophilia observed.

All attempts to cultivate the virus of the disease have, up to the present time, given negative results. In Florida investigators have endeavoured to claim discovery of the causative agent in the shape of a mould, but as no confirmation could be given by inoculation into animals, it is probable that some associated fungus has been isolated.

On culture media and various media for the cultivation of protozoa the results have all been of a negative nature. Several associated organisms and moulds from time to time occur on incubation, but fail to be pathogenic on inoculation into the horse or laboratory animals.

Besides general failure to cultivate the virus on all known media from the surface of the lesion, and from the deep foci not connected with the exterior, all endeavours to artificially produce the disease by direct inoculation of the discharges, transplantation of various portions of the active lesion, have met with failure. Taking into account that the period of incubation might extend over a long period, a year was allowed from the date of the experiments, and still no results were obtained.

Similar experiments were made to reproduce the disease by feeding, and by inoculation of abrased or scarified surface with diseased tissues, with negative results.

The general inclination on the part of stock-owners in Australia, and elsewhere where the disease is seen, is to believe that leeches are the cause, or are associated with the cause, of the disease. This theory is strengthened by the fact that in nearly all cases the position of the lesion is situated on those parts which are accessible from the water when an animal is feeding or standing in a swamp.

However, taking into account the great number of times every horse in swampy country must be bitten by leeches, the ratio of infected horses to the number of leech bites is infinitesimally small. Possibly the percentage of infected leeches, like infected mosquitoes, is likewise small, so that experiments with leeches from swamps can hardly be considered of importance, if the possibility of dealing with an infected leech is so reduced. However, the experiment was carried out on thirty horses, allowing them to stand in swamp until a leech was attached and noting position of bite, date, marks of horse, &c. These were observed either by owners or by myself for periods up to one year, but no positive results have been seen.

To test the leech theory in a systematic way, leeches were obtained from swamps in cancer-producing districts, and fed on cancerous animals. Twenty leeches were fed on lesions in various stages of development, from the acute, rapidly growing variety to the fibrous forms; ten others were fed on the margin of the growth near the spreading edge; ten on infected animals away from the lesion. In feeding these leeches, no particular liking was shown for the lesion itself; in fact, much more trouble was experienced in getting the leeches to feed on the lesion than on the non-infected parts. Again, in the natural condition how small the chance of a leech ever being able to bite a cancer-infected area? All the experiments with cancer-fed leeches were done on horses running on pastures principally in the low-lying swampy ground, and, to avoid confusion arising should an animal become naturally infected, careful note was made of the position of the leech bites.

Had positive results been obtained, I should be justified in giving detailed account and dates of all experiments with leech

feeding and inoculation of animals, but it will suffice here to state that no positive results were obtained.

Further experiments were tried on the assumption that some agent, naturally living in swamps on weeds or free in water, may assume a parasitic nature when finding lodgment by accident in the tissues through abrasions or injuries. Collections of swamp water were made, some from the surface, some near the bottom of swamps, and varying amounts injected subcutaneously after filtration, or allowing the suspended matters to precipitate. To test the possibility of the action of vegetable products as acids or enzymes producing lesions, small quantities of plants found in swamp were collected, kept in swamp water and injected subcutaneously and intradermally, all with negative results.

Clinical Articles.

BOTRYOMYCOSIS IN A COB.

By G. MAYALL, M.R.C.V.S.

Bolton.

On February 13 a bay gelding cob, 9 years old, was brought to the surgery for my attention. I found a hard and sensitive swelling on the point of the shoulder, measuring 8 in. long, 6 in. broad, and protruding about 5 in. high. Gave a bottle of cooling lotion (pot. nit. and ammon. chlor.) and prescribed 80 gr. of pot. iodide in the drinking water three times daily.

On February 17 the tumour was less painful, but still very hard. Injected tincture of iodine, 80 minims, into the depths of the swelling at three different points. The ordinary hypodermic syringe was used for this operation and three syringefuls of tincture of iodine, 4 dr. in all, were injected. A blister of 1 in 8 biniodide of mercury was then well rubbed in over the tumour and the pot. iodide still continued as medicine.

On February 19 the shoulder was injected and blistered again, and the medicine repeated.

On February 21 the tumour fluctuated and was soft at one point. It was lanced there and about a quarter of a pint of pus let out. Pot. iodide, 80 gr., and digitalis, 40 minims, three times daily prescribed.

February 22 and 23.—Swelling visibly lessened in size, but still hard and with an extensive base. Bathed with dilute creolin, well squeezed, injected with tincture of iodine at the incision wound and internal medicine continued. The wound was injected and dressed daily until March 3, when the swelling was still less in size. On that date it was reblistered with 1 in 6 of biniodide ointment.

On March 8 a stick of silver nitrate was inserted into the operation wound and its depths were well causticked. The same procedure was adopted on March 12. To-day, March 15, hardly a trace of the tumour can be seen, the contour of the shoulder has resumed its natural form, and the cob is fit for work. The medicine is, however, still being prescribed. The tumour was quite an inoperable one, except with considerable danger, and I think, even if it could have been operated on, that a favourable result has been produced more quickly than would have ensued from operating.

STERILIZED OIL IN ABDOMINAL SURGERY.

By Veterinary Surgeon RODER.

In order to hinder the development of pathogenic micro-organisms in the abdominal cavity of the horse during operations 50 grm. to 100 grm. of sterilized paraffin oil* is poured in through the operation wound. Once a 1 per cent. addition of camphor was introduced into the paraffin oil. The sterilization of the oil is effected by heating, that is, by boiling in a water-bath. The oil is poured in at blood-heat. No disturbance of the general condition of health occurs.—*Oesterreichische Woch. für Tierheilkunde.*

FUNCTIONAL EXAMINATION OF THE KIDNEYS IN THE HORSE.

By LORSCHEID.

According to researches undertaken by Lorscheid on horses affected with contagious pleuro-pneumonia, it is certain that this malady is almost always accompanied at the febrile rise by a nephritis characterized by albuminuria elimination of epithelial cells, and the presence of different organic sediments in the urine. These troubles are never encountered in strangles and catarrhal pharyngitis. Ordinary pneumonia is never accompanied by urinary troubles; diabetes and lumbago (hæmoglobinuria) do not demonstrate the existence of renal lesions.

To establish a differential diagnosis between parenchymatous and interstitial nephritis, it is necessary to recollect that in the former the elimination of colouring matter is slow, not abundant, and of short duration, whilst it is prolonged in interstitial nephritis.

The test for colouring matter in order to verify the renal permeability is made by injection of 8 dg. of carmine of indigo; one can then use an injection of 10 cg. of phloridzine, which determines the glycosuria.—*Deutsche tierärzt. Woch.*

* The "paraffin oil" referred to is "Paraffinum Liquidum," of the British Pharmacopœia.—G. H. W.

THE FLANK INCISION IN CRYPTORCHID OPERATIONS OF THE HORSE.

By E. C. WINTER, F.R.C.V.S.
Limerick.

I HAVE operated upon a large number of cryptorchid horses, both by the inguinal and the flank method, and on comparing the

Figure showing situation of the flank incision.

results I am very much in favour of the latter, as I consider that it gives the best after-results.

The situation I prefer is as shown in the photograph, just above the fold of skin in the right flank. Sometimes I open on

the right side and sometimes on the left, depending upon which testicle is retained in the abdomen.

The skin is shaved and rendered clean by scrubbing with ethereal soap and antiseptics or by painting with iodine and the incision made almost in a vertical direction, being closely sutured afterwards.

My experience of it is that one gets very little swelling, no interference with urination, no chance of subsequent hernia, and no adhesion of bowel or omentum to the operation wound.

AN UNUSUAL LESION IN THE HEAD OF A COW.

By J. A. JORDAN, M.R.C.V.S.

The City Abattoir, Belfast.

THE two photographs here reproduced show an interesting lesion in the head of a beast which was brought to the abattoir, presumably for food purposes, but for which the owner never came back to claim, even to obtain the price of the hide.

FIG. 1.—Side view of the whole beast.

My attention was called to the animal by one of my inspectors. The cow was much emaciated and her face, especially on the left side, enormously swollen, the skin being badly affected with dermatitis and covered with a thick crust of scurf and scale. Saliva was flowing freely from the mouth, and I thought at first that it was a case of aphtha or perhaps actinomycosis, but on *post-mortem* examination I was unable to find any confirmatory lesions of either of these diseases.

The skin, however, over the lips and cheeks, when cut across, measured rather more than 5 in. in thickness and resembled the appearance and consistency of fat bacon.

FIG. 2.—Photograph showing the swollen cheek and lips.

No trace of injury could be found, and as the owner did not return I was unable to obtain any history. I have never before seen a case like it, and am unable to offer any suggestion as to the actual cause of the malady.

LUMBAR PARALYSIS IN COWS.

By G. MAYALL, M.R.C.V.S.

Bolton.

Case 1.—January 14, called to a black-and-white cow, calved three days, unable to rise and showing moderate excitement, temperature 103° F. Gave ½ lb. of salts and left two doses of chloral and pot. bromide. Blistered her loins with cantharides blister. Cow got up two days after, gave a good supply of milk, and has remained quite right since.

Case 2.—Roan cow, down on December 8, 1913, and unable to rise. Subject quite restful, but not cudding; no rise of temperature. Prescribed drachm doses of am. carb. and tincture

of nux vomica night and morning and blistered her loins as in Case 1.

December 10.—Cow still down; repeated the blister and left more medicine.

December 13.—Subject still recumbent and blowing a bit. Blistered both her hocks and left medicine, liquor am. acet. 1 oz., glycerine of belladonna 1 dr., three times daily.

Cow got up on December 15 and has remained right since. This subject had calved six weeks before I attended her for the paralysis.

Case 3.—Red-and-white cow, calved three days, in a loose box, chewing her cud, but quite unable to rise. Blistered her loins on February 3, and left nux vomica and am. carb. Attended on February 5 and found cow still down and unable to rise. Blistered her loins again and applied blister to her hocks. Left nux vomica and am. carb. as medicine. She got up on February 7 and has done well since.

Remarks.—No loose boxes on the farms in Cases 1 and 2 and subjects had to remain in bad stalls. In none of these cases was there any coma. In none of them was the udder injected, and two of them did not rise until their hocks had been blistered, as recommended by Horst-Tempel. Unless there are pronounced symptoms of milk fever farmers prefer the udder not to be injected, and where the cow is looked on as a milking machine there is something in the objection.

OVARO-HYSTERECTOMY IN THE SOW.

By H. ASHLEY YOUNG, M.R.C.V.S.

Dunmow.

I HAVE within the past few years operated upon several sows with dystocia, and all have proved successful, more by luck than judgment, I am inclined to think. The first animal had a severe kick from a horse, which caused depression of the pelvis on the near side, with the result that there was not sufficient room for the fœtus to pass in the ordinary way. I informed the owner that the only thing to do was to operate as otherwise she would certainly die, and after gaining his consent I gave her chloroform, well washing her side with ethereal soap and shaving all hair from the seat of incision. The latter was made from the hip to within three or four inches of the mammary glands, directly through into the abdomen, and a towel wrung out of warm antiseptic solution (Kresophen) was held by an assistant to press the bowels back whilst I secured the left horn of the uterus. A ligature of ordinary iodoform tape was applied above the ovary, and the complete horn and ovary excised; in like manner the right horn and ovary was excised, after removing both horns to the outside of abdomen. A double ligature was then applied to the uterus and the whole organ removed. Deep sutures were then put

through the muscular portions of the side, and finally the skin was sutured, and a compress of cotton-wool (boracic) placed over the wound, the whole being held in place by a many-tailed bandage placed around body.

The animal seemed much exhausted after recovering from the effects of the chloroform, but within three hours of the operation drank some milk, and continued to improve within the next few hours and walked about, although very weak and lame. However, she continued to improve, and at the end of a week the deep sutures were removed, the wound doing well. The outside stitches were removed a few days after, and until this was done fresh compresses were applied twice daily, or oftener if displaced by the movement of the animal. Eventually the sow was sold fat for the sum of £8.

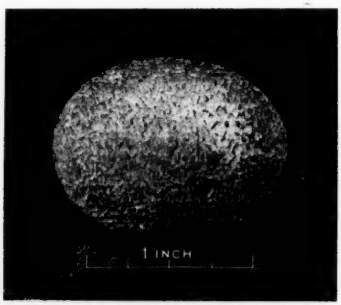
Four other similar operations have been performed, and all have done well, but I have never operated if any septic discharge has been observed from the vagina. My reasons for operating were simply because to allow the animals to remain in such a condition meant death to the sow, and loss to owner, and also that the operation was very similar to spaying (except as to its being on a larger scale), the latter being an operation in which I knew that the percentage of deaths was so very slight as to be considered almost *nil*.

Canine Clinicals.

AN INTERESTING CYSTOTOMY.

By W. C. HAZELTON, M.R.C.V.S.
Buckingham.

THE stone, of which a photograph is shown herewith, was removed from the bladder of a Pekinese bitch, aged 4 years, by supra-



Bladder calculus in Pekinese bitch.

pubic cystotomy. The animal had shown symptoms of bladder irritation for 12 or 15 months, continually squatting down and

passing small quantities of urine, the irritation at last becoming so troublesome that I decided to operate.

The anæsthetic used was chloroform, morphia being first administered, and a supra-pubic cystotomy was made in the usual way.

The stone weighed three-quarters of an ounce, and was about as large as a small walnut. The bitch made an uninterrupted recovery, and is now quite well and pregnant.

LUXATIO FEMORIS IN THE DOG.

By JULIUS DROSZ.

Dantzig.

The author observes that luxation of the femur which is only rarely noticed in the horse, occurs much more frequently in the ox and dog. From the statistics of the clinic for small animals at the Berlin College, luxatio femoris in the dog, in the years 1893 to 1912, shows a percentage of 0·2 to 1·0 of cases treated. Drosz has also examined several cases pathologically and anatomically. The dislocation of the hip joint in the dog, which occurs far more frequently, especially in towns and cities, than is generally supposed, arises exclusively from external causes, and is really a luxation of the femur above the cotyloid cavity. The ligamentum teres and joint capsule are both weak in the dog, and the capsule being torn the head of the femur slips out.

Cure results by the formation of a connective tissue sac round the luxated head of the femur (nearthrosis). The limb becomes functionally capable again, but its original mobility is never regained.

Translation.

EXPERIMENTAL VACCINATION AGAINST SHEEP-POX.

By M. CHARLES DUBOIS.

Veterinarian to the Department of Gard, France.

After making numerous experiments on sheep of different breeds with varying doses of vaccine, the writer of an interesting paper in *La Revue de Médécine Vétérinaire* arrives at the following conclusions:—

(1) Vaccination against sheep-pox produces far greater disturbance, both local and general, in very susceptible breeds of sheep than in the Algerian breed, which is not so prone to the disease.

Lambs and rams bear vaccination better than ewes, for in lactation the secretion of milk is considerably and persistently lessened, and in advanced gestation abortion has been known to occur, though only in rare instances.

(2) Vaccination confers on animals so protected a reliable immunity, which not only allows them to be exposed without danger to the ordinary risks of contagion, such as continual association with the infected, but it also enables them to resist drastic experimental inoculation.

(3) Vaccinated animals can be left in contact with the non-vaccinated without any danger to the latter.

(4) The employment of vaccines appears to be less efficacious than the practice of using serum for arresting infection in areas while sheep-pox is prevalent.

(5) In healthy flocks which are being exposed to contagion sensitized vaccines are especially useful. Considering their particular value in prevention they may be considered the best means of fighting the disease efficaciously—always supposing the immunization to be durable.

If, as we anticipate, subsequent researches confirm our satisfactory investigations, there is reason to hope that sheep-pox will speedily disappear—almost, if not completely—from France. In our opinion it would be sufficient to attack the very important centre of contagion which exists in Camargue, by vaccinating all the flocks in the district two or three months before the usual importation of Algerian sheep into France.

Being inexpensive, easily employed, and, above all, not likely to spread the infection, sensitized vaccines alone could be profitably used in such widespread operations which would undoubtedly have decisive results in the campaign against sheep-pox.

Reviews.

Das Kehkopfpfeifen beim Pferde (Roaring in Horses). By Dr. H. A. Vermeulen, Prosector in the Anatomical Institute of the State Veterinary School, Utrecht. Printed by A. Oosthoek, Utrecht. Price 4 marks 50 pfennigs. Published 1914.

This book deals with the literature, anatomy, physiology, and neurology of roaring. The composition and functions of the thyroid glands are discussed in twenty-nine pages of the letterpress, and Chapter V deals with the employment of thyroid gland powder as a therapeutic agent against paralysis of the recurrent nerve.

The author puts before his readers a new point of view for the etiology of left-sided paralysis of the larynx in the horse. He shows that this laryngeal affection is not localized in the larynx, but is a symptom of a widespread nerve disease. On anatomical grounds he is convinced that there is considerable predisposition to the disease. Finally, he relates experiments undertaken by himself in the therapeutical treatment of roaring by means of thyroid gland powder. The experiments are not conclusive, although results in some cases were favourable. Any-

body who desires to read some acute reasoning on the subject of roaring should get Dr. Vermeulen's book. It consists of ninety-seven pages, with seventeen illustrations in the text, and six coloured lithographs of microscopical preparations. G. M.

Encyclopédie Cadéac: Pathologie Interne-Nutrition, Auto-intoxication, Appareil Urinaire, Peau par Cadéac. One hundred and forty-three figs. in the text. Publishers: J. B. Baillière et Fils, 19 Rue Hautefeuille, Paris. Price 6 francs bound.

This is the seventh volume of the series which Professor Cadéac has produced in his "Encyclopédie Veterinaire." The ailments of nutrition, auto-intoxication, the urinary apparatus, and skin are dealt with and in many cases illustrated. Horses, cattle, sheep, pigs, goats, dogs, cats, and birds all come under the author's ken in the discussion of their varied diseases in the above connection. For the last ten years Professor Cadéac has been collecting material for his encyclopædia, and so far the result of his labours has been in every way satisfactory. The days when the horse and cow alone seemed worthy subjects for the veterinarian's attention are long since past, and the present-day practitioner has to pursue his studies in much wider fields. In the volumes comprising this encyclopædia the veterinary surgeon may gain adequate knowledge of the various diseased conditions affecting his many patients. All the sections in this work are good, and if we pick out one for special mention it is that dealing with skin ailments, which covers 275 pages. The articles on sarcoptic mange of the horse and scaly leg in fowls are masterly expositions of the subjects. The prescriptions given in the skin section are simple, and have all stood the test of practical utility. The work is a worthy successor to those that have preceded it, and we congratulate the author on having dealt with his theme so widely and thoroughly. The book is remarkably cheap, concisely written, and of inestimable value to veterinarians who can read French. The binding is tasteful and would single out the book for attention in any library, and the reader may take up the work for an odd leisure hour during the day and peruse it with profit and pleasure. G. M.

The Diagnosis of Dourine by Complement Fixation. By John R. Mohler, Adolph Eichhorn and John M. Buck, Pathological Division, Bureau of Animal Industry, U.S.A.

The authors give at the outset a brief introduction dealing chiefly with symptomatology, followed by an extremely interesting history of dourine in the United States.

In view of the great difficulty experienced in the diagnosis of the chronic and latent forms of the disease, the value of serum diagnosis as an aid in checking outbreaks and attempting its eradication is obvious. On the other hand, this method of diagnosis is of necessity somewhat limited in its application, since it can only be adopted in the case of animals which are kept

under a certain amount of restraint. In the case of outbreaks of dourine occurring among animals bred and kept under range conditions, and subject only to an annual round up, it is by no means easy to carry out a clinical examination, and the difficulties attending the withdrawal of blood for the purpose of testing the serum are almost insurmountable. Since, however, dourine exists among horses which can be safely handled, the complement fixation test should prove of inestimable value as an aid to the diagnosis of the disease.

The most serious problem which confronted the authors was the preparation of a suitable antigen. As was to be expected, the results obtained when suspensions of pure trypanosomes were employed as the antigen were much more satisfactory than those obtained when extracts from the various organs of diseased animals were used. The former antigen, however, was not employed for routine diagnosis on account of the difficulty attending its preparation and the small amount available.

The most suitable antigen for the purpose, according to the authors, consisted of a saline suspension of the ground-up spleens of white rats which had been infected with *Trypanosoma evansi*, the group nature of the reaction being taken advantage of. While such a crossed specificity doubtless exists to some extent, the results obtained would perhaps have been more convincing had a more specific antigen been employed. While the antigen was titrated both against known negative and positive sera, no mention is made of titrations being carried out with the spleens of normal rats as a control. It would seem that this would have been a valuable guide since apparently in some cases quite small quantities of antigen were capable of absorbing the complement due, the authors suggest, to the presence of an excessive amount of proteids in the spleen. Although it would appear that the technique might be to some extent improved upon, the results obtained were of great interest, for while the blood of normal horses showed in the presence of this antigen no fixation of the complement, that of horses affected with dourine possessed a complement binding titre varying from 0·15 to 0·02.

The complement fixation test as an aid to the diagnosis of trypanosomiasis in both man and the lower animals should prove of the utmost value, but in localities in which more than one variety of parasite is found the antigen would necessarily have to be of a more specific nature. J. B. B.

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